

great central volcano. The cracks have diverged on all sides from this centre of action ; and the molten lava immediately flowing up would come forth in greatest quantity from the centre, and there result in and produce the great crater, while the radiating cracks would yield smaller portions *simultaneously* all along their course, however extended.

II. Observations of the Solar Eclipse of 1843, December 21, made at the Observatory of Trevandrum. By John Caldecott, Esq.

The account of the eclipse is communicated in a letter to Mr. Baily, dated February 21, but was unfortunately too late for the mail of that month. Mr. Caldecott having satisfied himself that the eclipse would be total, in latitude $11^{\circ} 45'$ north, and longitude $5^{\text{h}} 3^{\text{m}}$ east, determined on proceeding to the neighbourhood of Tellicherry (on the coast), for the purpose of observing it. It was necessary to be very precise in this calculation, and also to be very certain of the geographical position of the spot selected for observing the eclipse, on account of the almost exact correspondence in size of the sun's and the moon's discs. Mr. Caldecott, in the first place, proceeded by sea to Mahe (a little to the south of Tellicherry), and thence up the Mahe river towards its source, and having, by a careful survey of the river, ascertained its position with respect to Mahe (whose latitude and longitude he had previously ascertained), he selected a clear and open space on a rising ground, about three miles north of it, and there pitched his tent at midnight of December 20. He had brought with him an excellent 30-inch achromatic telescope, having an object glass of $2\frac{1}{4}$ inches aperture, with an eyepiece giving a magnifying power of about 50, protected by a smoked glass gradually increasing in intensity from one end to the other, and sliding easily in a groove, wherewith to observe the eclipse ; a sextant and artificial horizon, with a good pocket watch for time ; and two native assistants, with an actinometer for observing the rate of decrease of solar radiation.

At daylight on the 21st (civil reckoning), the author mounted his telescope on a stand having a very smooth parallactic motion, and made all the necessary preparations, taking a set of altitudes of the sun's lower limb at about 7^h A.M., and stationing the native observers at the actinometer. He began watching the point of the sun's disc, where the edge of the moon's limb was to impinge at 7^h 35^m, the sky being at this time quite clear in every direction, with the exception of a few light fleecy clouds which hung about the sun, but which cleared away before the eclipse became total. The observations that follow were taken almost verbatim from the author's notes written during the progress of the eclipse. At 7^h 38^m 49^s, corrected mean solar time, civil reckoning, the contact was evident, though the real first contact was probably two or three seconds earlier. With one digit eclipsed the border of the moon was fully as tremulous as that of the sun, and no hollows or coruscations were to be seen. No appearance of any *inherently* bright spots about the moon's disc was observed about this time,

and no spots on the sun. The cusps were perfectly sharp and distinct; the colour of the sun a pearly white, inclining to a metallic or silvery white. With eleven digits eclipsed there was no appearance of a corona, but, shortly after, three protuberances were observed near the southern cusp, and none on the other. [This is illustrated by a drawing.] As the conjunction of the discs approached, Mr. Caldecott watched very closely for the "beads," but saw none until the very instant of conjunction, when the whole of the southern limb of the sun broke up into most beautiful beads of silvery light, with a clear but very fine line of light joining them, and extending somewhat beyond them, until lost in the corona of the opposite limb. [This is illustrated by a drawing.] These beads for the second or two of their remaining, appeared to form, break up, and form again, and resembled globules of mercury of different sizes in a state of violent agitation.

They never entirely disappeared, so that the sun wanted the *smallest* imaginable quantity of being *totally* eclipsed here. The corona was very faint and of a greenish yellow colour, occasioned doubtless by seeing it through a very thin film of smoke, for the total removal of the darkening shade had not been provided for. It was never quite dark, or too dark to read off the actinometer: *Venus*, *Saturn*, and *Arcturus* were seen by the author's servants, who had been instructed to watch for stars. Mr. Caldecott saw nothing of the luminous protuberances noticed by Mr. Baily and Mr. Airy, but the greatest obscuration was so momentary in this eclipse, that there was no time for the eye to give more than a glance round the disc before the sun and moon were again separating, and strong light was restored. Shortly after 9^h A.M. the author took another set of altitudes of the upper limb of the sun, and the appearances during the separation of the two bodies were observed every few minutes, but nothing worthy of remark was seen. The actinometer readings and the resulting radiation are given in an accompanying table, together with some occasional readings of a thermometer taken at irregular intervals during the progress of the eclipse. The impression on Mr. Caldecott's mind is, that the beads are the effect of the incessantly varying refraction of the atmosphere on the two limbs, causing each of them to have an apparently dancing or *bubbling* motion, and thereby producing the appearance of spots of light, with intermediate dark spaces or bands, after the body of the sun is in reality covered by that of the moon, just as a planet or bright star when dipping into the horizon is frequently seen on a fair, clear night at sea to disappear and reappear repeatedly. This appearance of heads he believes to have been observed hitherto only at the eastern and western limbs, and, as these approach to and recede from each other *gradually*, the dark spaces or lines are more distinct for the moment of their appearance than in this case, where the limbs just grazed along each other, as it were, and in which, therefore, the bright spots assumed more of the form of globules, altering their shape, size, and position, as the two bodies moved past each other, with inconceivable rapidity.

The corrected observed time of the termination of the eclipse was $10^h 28^m 51^s.5$ A.M.

The Longitude of the place of observation is $5^h 3^m 4^s$ East.

The Latitude $11^\circ 44' 38''$ North.

III. Sextant Measures of the Sun at the Eclipse of the Sun on the 21st December, 1843. By Captain Sir Edward Belcher, R.N. Communicated by Captain Beaufort, R.N.

The observations consist of nineteen measures of the breadth of the illuminated portion of the sun during the progress of the eclipse. The longitude of the place of observation was $124^\circ 12' 30''$ east, the latitude $24^\circ 21' 20''$ north.

IV. On a Graphical Method of Predicting Occultations. By J. I. Waterston, Esq. Communicated by Captain Beaufort, R.N.

The following is the author's account of his method:—

“The following is a description of a graphical method of predicting occultations, which I have found useful in drawing the attention of some of my pupils to this valuable method of determining meridian distance.

“The prediction of the time is almost an essential preliminary to the observation, and the computation required for this, in the usual way, is such as to put it altogether beyond the reach of many who would otherwise be perfectly able and willing to make the observation, and who have many valuable opportunities in the course of their profession of improving geography by such means. The method is simply delineating the essential points in the orthographical projection of the moon's motion and that of the observer in a plane perpendicular to the direction of the star. This is simplified to the utmost by means of scales, and I find that, with a little practice, my pupils have no difficulty in predicting the time of observation to 1 or $1\frac{1}{2}$ minutes, and this without much care being taken in the drawing. From several occultations, which I predicted and observed here, and from numerous examples taken from the Astronomical Society's *Transactions*, I find that, with ordinary care, the predicted time may be depended upon within one minute, and that the time occupied in doing so varies from 10 to 15 minutes. As this is sufficiently near for all the wants of the observer, it may, perhaps, serve to supersede the method of computation, which, in its simplest form, is an irksome task, and probably tends to make occultations less frequently observed than they otherwise might be.

“With officers duly initiated, and observatories at work, observing all that are visible as a regular part of their duty, the most valuable results to geography might be anticipated.

“I have appended a rule for computing the moon's right ascension and the consequent error of assumed longitude, which is derived from the same method of orthographical projection. It is rigidly correct in principle (with the exception of taking small arcs instead